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THE RICHARDS LECTURE* — Part I

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I fully realize and appreciate the great honour you have conferred on me by asking me to deliver the first Richards Lecture of the Canadian Association of Radiologists. I am also very conscious of my inability to do justice to the task of properly honouring one who has played so great a part in the development of radiology not only in Canada but in the world at large. I was fortunate in being associated with Doctor Richards from the time I started my training in radiology until his death, during which time he was teacher, partner, advisor and friend. He died a martyr to science four years ago this month but his influence is still very strongly felt in our Association and will be as long as one person who knew him remains in practice. His writings and teachings and his noble example of unselfish devotion to the cause of human suffering will remain an example to all who follow.

It is the custom for learned medical societies to establish lectureships in honour of some outstanding member of their group who has passed to his reward. These lectureships are based on the service of the individual to the society concerned and his contribution to the honour and advancement of medicine. That three years had elapsed between his death and the decision of our Association, at the last annual meeting, to found this lectureship adds to the honour to the late Doctor Richards, as the decision was taken after mature deliberation and after the passage of time had allowed a truer perspective of the man and of his influence on Canadian Radiology. That the Canadian Association of Radiologists should establish this lectureship in honour of Doctor Richards is entirely fit and

proper, for as well as being one of Canada's greatest radiologists he was directly responsible for the formation of this Association. Since the previous national radiological body, the Canadian Radiological Society, voted itself out of existence in nineteen hundred and twenty-six to become the Section of Radiology of the Canadian Medical Association, there had been an increasing need for a national radiological society for the advancement of the scientific, social and economic aspects of our specialty. Realizing this need, Doctor Richards issued invitations to leading radiologists from Vancouver to Halifax to attend a meeting in Toronto on the fourth and fifth of January, nineteen hundred and thirty-seven. The meeting was well attended by both English-speaking and French-speaking radiologists and our Association, uniting all qualified to belong, is a great and lasting tribute to the wisdom and understanding of the man who was responsible for its formation. Declining the honour of being president of the Association, he was, however, the mentor behind the scenes and a constant source of sound advice and inspiration. He was the first Chairman of our Inter-relations Committee and was for many years Chairman of the Committee on Radiology and Examiner for Certification and Fellowship in Radiology of the Royal College of Physicians of Canada. He strove constantly to improve the status of radiology as a clinical specialty in medicine by advocating and demanding better training and higher standards of practice. A tireless and meticulous worker himself, he was intolerant of carelessness or half-hearted effort on the part of others, and of delay in the application of newer and better methods of examination or treatment of patients.

That he was a great teacher is well known and many here to-day are his pupils, having studied under him in the peace-time courses

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before or after the war or in the armed services' course in which so many Army and Air Force Medical Officers, and some Naval Officers, commenced or continued their radiological studies. His department was always open to visiting radiologists and these he welcomed not only to show them his methods but to exchange ideas in a constant search for newer and better ways of doing things. To all of us his name is associated with the University of Toronto, where he was the first Professor of Radiology and Head of the Department, with the Toronto General Hospital, where he was the first Radiologist, and latterly with the Ontario Cancer Treatment and Research Foundation, of which he was Managing Director.

Various organizations have paid tribute to the late Doctor Richards in biographies in their journals. A few items not presented before may be of interest to you as members of this Association. His first radiological appointment was to St. Paul's Hospital, Vancouver, in nineteen hundred and twelve. While serving overseas in World War I he was relieved at St. Paul's by the late Doctor Wesley Prowd of fond and revered memory, a Past President of this Association. Prowd and Richards were classmates at school and life-long friends. Taking charge of the department of the Toronto General Hospital in nineteen hundred and seventeen, he was joined shortly afterward by Doctor W. Howard Dickson with whom he was associated as confrere and partner until Doctor Dickson's death in nineteen hundred and thirty-three. Doctor Dickson was also a perfectionist and an indefatigable worker, a man to whose genius in gastro-intestinal radiology so many of us owe so great a debt either directly or indirectly. In the early nineteen hundred and twenties the late Doctor Lloyd Ritchie joined the staff of the department, and though Ritchie was associated with the Toronto General Hospital for a relatively short period of time, his kindly manner and generous understanding made a lasting impression on all who were associated with him. In nineteen hundred and twenty, eighteen Ontario radiologists met in the Board Room of the Toronto General Hospital to officially adopt the constitution and by-laws of the Ontario Radiological Society. Doctor Richards was the first Secretary of this Society and was its President in 1924. In honouring Doctor Richards I think it fitting to pay tribute also to those men who were associated with him in the early days and to whom Canadian Radiology owes so much. May their names and deeds and those of others of their generation be not

forgotten, but be held up by those of us who knew them as an inspiration to those who follow.

While in later years Doctor Richards became an international authority on radiation therapy he had already won wide recognition in diagnosis and had developed a number of items of accessory equipment, including the Richards table top for gastric examinations and the first magnetic-type marker for the orthodiascope. He wrote a number of articles on diagnostic subjects, notably on diseases of the chest, and was one of the earliest writers to describe and explain the triangular basal shadows in the lung in lower lobe bronchiectasis with atelectasis. His interest in treatment of cancer, however, was the driving force of his life and his contributions in this field were outstanding. He was a pioneer in cancer treatment by radiation and many of the extensions of radiation into fields previously considered surgical and many improvements and refinements of techniques were due to his perseverance and his fertile brain. In nineteen hundred and twenty-one the first two hundred kilovolt machine for therapeutic use in Canada was installed under his direction. He designed a tube stand which provided movement in both directions for centering, the tube being supported in an open glass bowl. The filter slots were wired in in such a way that the unit could not be operated if the filters were not in place, a procedure which has since come into widespread use. A lead-shielded chair for perineal treatment was also designed by him about this time. The growth and general acceptance of radiation treatment of cancer was a gradual one, at first hopeless cases only being referred for high voltage X-ray and radium therapy. The results of these treatments, due in no small part to the indefatigable efforts, ingenuity and courage of Doctor Richards, led to a steady growth in the volume of treatment work done. Newer and improved techniques contributed further to the good results obtained. The great increase in volume of treatment work accompanied by the increase in diagnostic work in the department led to a division of effort and to almost complete division of staff, though the two branches continued to be housed together. By nineteen hundred and forty-three the volume of treatment work had become so large that aid of the Provincial Government in financing the treatment of indigent patients was obtained through the establishment of the Ontario Cancer Treatment and Research Foundation. This body set up its first Institute of Radiotherapy in the Toronto General Hospital with

Doctor Richards as its Director. His interest in the work of the Foundation is well stated in their Annual Report for 1949,² which states: "The accomplishments of the Foundation were due in a very large measure to Doctor Richards' vigorous leadership and to the time and effort which he gave voluntarily as Managing Director of the Foundation from 1945 until the time of his death and as Chairman of the Advisory Medical Board from 1944 until his death".

Honours sat lightly on his shoulders and no Canadian radiologist has been so honoured. He was a Fellow of the Royal College of Physicians of Canada, Fellow of the American College of Radiology, an LL.D. of

Queen's University, Honorary Member of the Royal Society of Medicine and Skinner Lecturer of the Faculty of Radiologists of London. He was, however, a very human and kindly physician who welcomed the opportunity to consult with his confreres and who always had time to talk to and encourage his patients regardless of their social or financial standing and whose greatest joy in life was the cure of cancer or alleviation of suffering caused by it.

(Editor's Note: Second part of The Richards Lecture Some Radiological Aspects of Cancer of the Colon will appear in the following (September) issue of the J.C.A.R.)

CARCINOMA OF THE BREAST, WITH PARTICULAR REFERENCE TO PRE-OPERATIVE RADIATION*

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In 1947 the late Dr. G. E. Richards¹ published a paper on carcinoma of the breast, which contained a survey of the results of treatment combining surgery with radiotherapy. In his paper an attempt was made to assess the value of pre-operative in contrast to post-operative irradiation. At that time approximately 1000 cases treated post-operatively had to be compared with only 68 cases radiated prior to surgery. At the present time when the figures can be brought up to 1947, the post-operative group can be compared with 135 cases irradiated pre-operatively. This figure is statistically more significant, offering a more valuable comparison.

The presentation of this revised comparison is not the sole purpose of this paper. The main objective is to present a summarized account of the treatment plan employed in the Department of Radiotherapy, Toronto General Hospital for carcinoma of the breast. The radiotherapy is under the direction of Dr. C. L. Ash, with Dr. N. C. Delarue as Surgical Consultant.

The patients when referred may fall into any one of the following categories:

1. Undiagnosed (questionable) breast lumps, suspicious of malignancy.
2. Following local excision of breast lump found to be pathologically malignant.
3. Following simple mastectomy.
4. Following radical mastectomy.
5. Clinical primary carcinoma of breast.
6. Recurrent or metastatic carcinoma of the breast.

When confronted with a case in the first category, the undiagnosed breast tumour, a surgical consultation is advisable. If the clinical features suggest a benign lesion the safest procedure is to first aspirate the lump to rule out a cyst, then, if no fluid obtained, an ex-

cision is advisable to verify the pathology. In order of incidence, this lump may be cystic hyperplasia, fibroadenoma or a duct papilloma, any one of which may become malignant, hence the necessity for surgical investigation. If multiple breast nodules are palpated, the patient can be kept under close observation before investigating the most prominent one by surgical means.

A patient in the second group, i.e., following local excision, is a candidate for either surgery or radiotherapy, depending on the circumstances. In our Institute these patients often arrive from the more remote districts in Ontario, where the conveniences for surgery are not readily available. If the interval between the excision and referral is under two weeks and if no suggestive residual disease or spread is found on examination, the patient is considered a surgical problem initially, and irradiated post-operatively. More than two weeks' delay, or suggestive clinical findings on admission, we believe, warrant immediate pre-operative irradiation followed by surgery.

The first two groups constitute only a very small percentage of the total number of patients admitted for treatment, but the number of cases in the third group, i.e., following simple mastectomy, is gradually increasing, particularly since Professor McWhirter^{2,3} has reported equally as good five and ten-year survivals irradiating carcinoma of the breast after simple mastectomy as following radical mastectomy. We are not entirely convinced that this is the method of choice for all breast cancers, but we have fallen heir to a small series of cases thus treated in the past, and hope to be able to report on it in the near future. In our series, so far, the simple mastectomy has been performed not as a method of choice but for other medical reasons.

The cases referred for radiotherapy following radical mastectomy still constitute the largest group. There is no evidence available to suggest that post-operative radiotherapy increases the survival rate Stage I carcinoma of the breast, but the cases admitted for treatment in this stage are not refused treatment if there is sufficient evidence that they might benefit. One has reason to believe that Stage

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Inner hemisphere lesions should profit by radiating the internal mammary and supraclavicular lymphatic chain. Those in all stages beyond Stage I post-operative, are irradiated routinely.

The cases of clinical carcinoma of the breast, the fifth group of patients admitted for investigation and treatment, are advised according to the stage of the disease present. A clinician in any medical specialty welcomes the opportunity to follow a patient throughout the entire course of the illness from its onset and to share in the control of the disease in close co-operation with the clinician of any

other specialty concerned. This ideal situation is not economically possible in this country, but in part explains the particular interest and satisfaction received in helping to control the cases with primary carcinoma of the breast untreated on admission.

Before explaining the methods of control of primary carcinoma of breast, the staging of the disease will be reviewed. The classification adopted by the Toronto General Hospital has been useful in planning treatment, but it is not a classification which would be accepted by the World Health Organization, in that it has five stages instead of the usual four: —

STAGE I	Skin	— not involved.
	Tumour	— localized in breast, movable, 1-3 cm. in diameter.
	Metastases	— none in axillary lymph nodes or elsewhere.
STAGE II	Skin	— not involved.
	Tumour	— localized in breast, movable, 3-6 cm. in diameter.
	Metastases	— few axillary lymph nodes involved; no other metastases.
STAGE III	Skin	— attached, dimpled but not obviously invaded or nipple retraction.
	Tumour	— localized in breast, more than 6 cm. in diameter; attached to fascia but not fixed to chest wall.
	Metastases	— few axillary lymph nodes may be present or the axillary lymph nodes may not be involved.
STAGE IV	Skin	— oedematous or brawny induration or peau d'orange, or ulceration or local skin nodules or evidence of acute inflammation.
	Tumour	— diffuse infiltration or rigid fixation to chest wall or oedema of breast.
	Metastases	— many axillary lymph nodes may be involved or fixed; no clinical or roentgenological evidence of distinct metastases.
STAGE V	Skin	— as in any other group or stage or with secondary nodules beyond the periphery of the breast.
	Tumour	— as in any other group or stage.
	Metastases	— extensive axillary lymph node involvement or supraclavicular lymph node involvement or clinical or roentgenological evidences of distant metastases.

Stage I can be so adequately controlled by radical surgery only that radiotherapy is omitted to avoid unnecessary damage to normal tissues, except in the circumstances previously mentioned.

The Stage II cases admitted to our clinic are referred for immediate surgery to be followed by post-operative X-ray treatment. R. S. Handley,^(4,5) who has been performing super-radical mastectomies for several years, reports that 46% of patients with axillary nodal involvement have also deposits in the internal mammary nodes, and Andreassen⁽⁶⁾ reports that 33% of these patients show

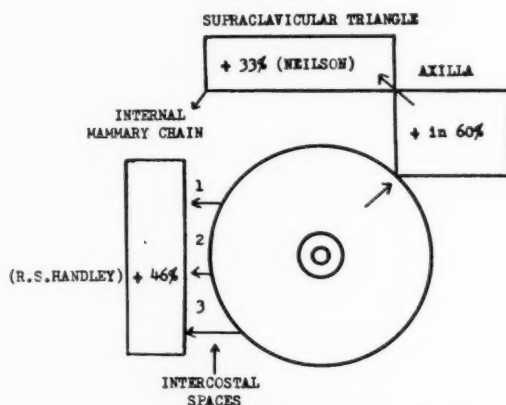
metastases in the supraclavicular area (Table I.) The surgical staff of our hospital do not advise this super-radical operation, and depend on post-operative irradiation to control the suspected or possible spread to all the proximal lymphatics after the axillary nodes have been proven to be involved.

Stage III is the borderline controversial stage. This is the added stage of the five stage classification which was separated from the Portmann Stage II classification, because our former breast survey revealed the fact that the majority of local recurrences following surgery and post-operative radiation occurred

in this segregated group. These cases presenting evidence of local spread or the retraction phenomena are now considered as a separate group and are being irradiated pre-operatively, with the hope that the percentage of local recurrences will be radically reduced. The hope is also entertained of reducing the incidence of positive axillary pathology. The actual survival comparisons will be presented later, but up to the end of 1947 thirteen Stage III cases had been irradiated pre-operatively, and so far none of these have developed local recurrences; only three of these had positive axillary pathology at surgery.

Table I

LYMPH NODE INVOLVEMENT IN MAMMARY CARCINOMA



Cases thought suitable for radical mastectomy

The Stage IV primary carcinomas of breast are routinely irradiated pre-operatively in this Clinic. In addition to the purposes as outlined for Stage III they are irradiated as an aid to surgery, effecting a preferable state of operability. Since the present records show a five-year follow-up on almost a hundred cases in this stage, one can speak with confidence about the improved survival rate in cases so treated, when it is compared with that obtained by cases treated by post-operative radiotherapy.

The treatment of Stage V is nearly always a radiological problem throughout. A simple mastectomy may later be indicated to remove a persistent ulceration or local recurrence with impending breakdown. A few surprisingly long survivals are obtained in this group even in the presence of distant metastases, but in general the prognosis does not warrant radical treatment, either surgical or radiological.

The last, but not least, group of cases admitted for consideration are those referred initially for control of secondary carcinoma. Early, and especially single, metastatic lesions are irradiated hoping for prolonged control, but if widespread metastases are proven only the metastatic lesions giving symptoms are treated. In the younger age groups hormone therapy is instituted on the appearance of the first metastatic lesion, but in the older age groups it is reserved for administration after radiotherapy has proven ineffective.

Before giving the survival comparisons, the following is an outline of the radiological methods employed. With the exception of Stage V primary carcinoma, the course of treatment is essentially the same in all stages both pre- and post-operatively. We are now using a modification of McWhirter's technique. The entire anterior and lateral chest wall, including the parasternal nodal region, is irradiated using two opposing 10 x 20 portals, mesial and lateral. The portals are alternated daily, and using a 400 K.V. apparatus, H.V.L. 3.5 mm. Cu., and a daily dosage of 350 r measured in air, an approximate tumour dose of 4000 r is delivered to the chest wall in two weeks, provided the patient is of average stature. If the patient is of small stature or is known to have a sensitive skin, a safer procedure to obtain this effect is to administer 200 r (air) daily to both opposing portals, giving approximately the same or slightly larger total dosage with less risk of skin damage.

Both axillary and supraclavicular regions are included in the second stage of the treatment. These regions are also irradiated by two opposing portals, anterior and posterior, alternately. The same factors apply and an adequate concercoidal dose can be delivered in two weeks.

Larger daily dosages over a shorter period of time are advised for the more advanced Stage V cases, and only obvious involvement treated.

Having reviewed the plan, method and purpose of irradiation for all groups of cases, I will now show what evidence we have so far accumulated to evaluate the advantages of pre-operative radiotherapy.

Table II presents collected data on surgical reports from various centres as compared with combined surgery and radiotherapy. Post-operative radiotherapy is estimated to increase the five-year survival rate approximately 10-15%.

Table II
MAMMARY CARCINOMA
RESULTS OF DIFFERENT METHODS OF TREATMENT

METHOD	5 YEAR SURVIVAL	10 YEAR SURVIVAL	TYPE OF CASES
Untreated Daland Nathanson & Welch	22% 19%	32% 5% (graph)	All Cases
Surgery Alone Collected Data Presbyterian Hospital (Excluding Categorical- ly Inoperable Group)	33% 50%	32% With Involvement of Axillary Nodes Presbyterian Hosp. 20% Memorial Hospital 21%	Cases Selected for Radical Mastectomy (Mostly Stages I - III)
Radical Mastectomy Post-Operative Radiation (Toronto General Hospital)	43%	26% With Involvement of Axillary Nodes - 23%	82% Stages I - III (18% Stages IV - V)
Pre-Operative Radiation Radical Mastectomy (Toronto General Hospital)	40%	16%	88% Stages IV & V
Simple Mastectomy Post-Operative Radiation (McWhirter)	42%	25%	All Cases (56% "Operable" Group) (Mostly Stages I - III)

Table III shows the comparative five-year survivals of post-operative and pre-operative radiotherapy. Of the pre-operative group the

numbers of cases in the first three stages are not sufficient to make a significant comparison. But up to 1947, 93 cases of Stage IV carcinoma were irradiated pre-operatively,

Table III
FIVE YEAR SURVIVAL
CARCINOMA BREAST IRRADIATED
POST-OPERATIVE VERSUS PRE-OPERATIVE

STAGE	POST-OPERATIVE 1933-42		PRE-OPERATIVE 1933-47	
	NO. CASES	GROSS %	NO. CASES	GROSS %
I	147	81%	4	75%
II	193	54%		
III	398	38%	13	69%
IV	147	16%	93	42%
V	36	3%	25	20%
All Stages	921	43%	135	41%

Table IV
CARCINOMA BREAST IRRADIATED
PRE-OPERATIVELY

STAGE	1933-41 — 5 YEAR SURVIVAL		
	NO. CASES	GROSS PERCENTAGE	NET PERCENTAGE
I	1		
II	3	75%	100%
III	13	69%	75%
IV	93	42%	45%
V	25	20%	22%
TOTAL	135	41%	45%

10 Untraced and D.E.D. under 5 years

and these have a 42% five-year survival, which is comparable to the overall five-year survival of all stages irradiated post-operatively.

In addition to the gross five-year survival of the pre-operative cases, Table IV shows the net figures, excluding from the study ten cases which were either untraced or which died of extraneous disease under five years following admission.

It is of interest to discover whether or not there has been any improvement in the gross five-year survival rate since this method of treatment was first adopted in 1933. The first five years were rather discouraging, but still showed an improvement over post-operative treatment. In 1937 more adequate equipment was installed, and the improved results are evident in the cases treated from 1938-1947. The average five-year survival of the latter ten years is more than 45%. This increase of approximately 18%, as shown in Table V is very gratifying.

Table V

PROGRESS OF PRE-OPERATIVE RADIOTHERAPY

YEARS TREATED	CARCINOMA OF BREAST, 1933-47		
	NO. CASES	GROSS 5 YEAR SURVIVAL	NET 5 YEAR SURVIVAL
1933 - 1937	29	27.6%	32 %
1938 - 1942	39	46.2%	50 %
1943 - 1947	67	44.8%	46.9%
TOTAL	135	41.5%	44.8%

10 Cases Omitted In Net % Calculation

The improvement in results is continued in the ten-year survival as demonstrated in Table VI.

Table VI

PROGRESS OF PRE-OPERATIVE RADIOTHERAPY

YEARS TREATED	CARCINOMA BREAST, 1933-42		
	NO. CASES	GROSS 10 YEAR SURVIVAL	NET 10 YEAR SURVIVAL
1933 - 1937	29	6.9%	8%
1938 - 1942	39	20.5%	24.2%
TOTAL	68	14.7%	17.1%

*10 Cases Omitted In Net % Calculation

Table VII shows an attempt to estimate the percentage of primary breast tumours which are sterilized by X-ray treatment. This figure varies greatly according to the size and the pathology of the primary lesion. But in the present pre-operative series 18% of all cases showed negative pathology at time of surgery following a previous biopsy positive for malignancy.

Table VII

STERILIZATION OF BREAST CARCINOMA BY RADIOTHERAPY

1933 - 1946		
STAGE	NO. CASES	PATHOLOGY NEGATIVE
I - III	17	5 (29%)
IV - V	118	19 (16%)
I - V	135	24 (18%)

It is almost impossible to estimate the percentage of axillary lymph nodes sterilized by x-radiation, since one is never certain pre-operatively whether or not the palpable nodes contain any malignant cells, and even the non-palpable nodes are often involved. Table VIII is subject to error but gives the percentage of the 45 cases with grossly enlarged axillary nodes prior to radiotherapy in which axillary pathology was negative when the radical mastectomy was performed.

Table VIII

STERILIZATION OF AXILLARY NODES

1933 - 1946		
GROSSLY ENLARGED ON ADMISSION	NEGATIVE PATHOLOGY	PER CENT.
45	21	47%
Of 92 Cases — Radical Mastectomy Following		

Certain factors which influence the prognosis of carcinoma of the breast have created much clinical discussion during the past few years. It has been reported by McKinnon⁽⁷⁾, following an age specific statistical analysis, that the death rate due to carcinoma of the breast has not been reduced for several decades, even with the improved methods of treatment. It has been suggested that secondary haematogenous involvement has already

occurred by the time the disease is recognized clinically in a certain group of cases and that this predisposition depends on the biological properties of the neoplastic process. This reasoning has suggested that early diagnosis and adequate treatment do not alter the incidence of distant metastases. The comparatively small improvement in the overall survival rates resulting from the conventional treatment methods over untreated carcinoma of the breast, coupled with the high incidence of malignancy found in the regional but less accessible lymph nodes as demonstrated by Handley⁽⁴⁾ and others, has led to much speculation on the possibility of improving the control of the disease. Experiments during the mastectomy procedure have shown that dissection of any of the lymphatic regions increases the danger of spread by the haematogenous route. This is the basis for McWhirter's⁽³⁾ Edinburgh experiment, employing the treatment policy of simple mastectomy followed by radiotherapy as a means of controlling the lymphatic extension.

These important findings and conflicting theories in spite of having added to the confusion have stimulated a keener interest in the possible control of mammary carcinoma. The clinicians who are observing large numbers of cases are the first to agree that these possibilities are partially valid.

The fact that the death rate from breast cancer has not risen, one can interpret as being encouraging when one considers the progressively increasing recognition of the disease by both the medical and lay public, as well as the fallacies known to occur in death certificates in the past. The theories suggesting the predestination of breast carcinoma one can accept as pertaining to only a minor percentage of the total number, when one is familiar with the more concrete clinical influences determining the course of the disease, as well as the progress which has been made by the more skilled surgical groups, and the advances in radiotherapeutic methods. Time here does not permit us to recount the numerous surgical experiments which have been reported which tend to refute the arguments frowning on early diagnosis and more meticulous treatment.

It is generally accepted that approximately 20% of all true Stage I cases of breast carcinoma develop distant metastases within ten years following treatment. Adequate treatment of Stage I cases practically eliminates the possibility of direct lymphatic extension, leading to the conclusion that the failures are

due to haematogenous spread prior to treatment. If this is a likelihood in Stage I, it can be assumed to apply to all stages of the disease. Thus the responsibility for the cure of the remaining 80% is divided between the delay before recognition and the institution of treatment, and the precision of the surgical and radiological control.

There is no pre-treatment test which can anticipate this highly malignant early metastasizing tendency. Some observers suggest that the clinical interpretation of this tendency could be the rate of growth of the primary tumour as estimated by the stage-duration since onset, ratio. In the present pre-operative series one finds equally as many five-year cures amongst the fast-growing group as the slow-growing. Table IX shows this comparison with relation to percentage five-year survivals. This comparison is subject to error as we have to depend on the patient's memory in estimating the duration of symptoms.

Table IX

INFLUENCE OF RATE OF GROWTH

CARCINOMA BREAST 1933-46 (PRE-OPERATIVE)		
DURATION ON ADMISSION	NO. CASES	% 5 YEAR SURVIVAL
Under 1 Year	74	38%
1 - 3 Years	39	44%
Over 3 Years	22	45%
TOTAL	135	41%

Further cytological studies may prove to be a more correct means of predicting the tendency to early haematogenous metastases but, clinically, it seems reasonable to link this factor with a history of increased hormonal influences. The normal breast physiology is so entirely dependent on ovarian stimulation that any abnormal variation would naturally be reflected in a correspondingly abnormal condition of the breast. As shown in Table X, the pre-operative series of predominantly late cases demonstrates a five-year survival of close to 60% by removing those cases whose first symptoms occurred during the menopausal years, leaving only a 10% five-year survival in the latter division. The ten-year survival is not included in the table, but in the menopausal group it is zero, and excluding it, the percentage is approximately 30, the overall being 20% in the 1938-42 group. Thus it

is the strongest single clinical influence predisposing to metastases. Horsley⁸ since 1937 has recommended and practised surgical castration at the primary mastectomy operation for this group, as well as for the younger age group. Our experience with the premenopausal age group would not warrant this radical procedure, unless other factors indicated a risk of metastatic disease.

Table X
INFLUENCE OF AGE (IN RELATION TO
MENOPAUSE) AT ONSET

CARCINOMA BREAST 1933-46 (PRE-OPERATIVE GROUP)			
ONSET	NO. CASES	5 YEAR SURVIVAL GROSS	5 YEAR SURVIVAL NET
Prior to Menopause	24	54.2%	59.1%
Concurrent with Menopause	39	10.2%	11.1%
Post-Meno- pausal (5 Year)	72	54.2%	58.2%
TOTAL	135	41.5%	44.8%

Another clinical factor influencing the extension of the disease, but not necessarily by the haematogenous route, is the site of the primary lesion.

According to R. S. Handley⁵ at least 60% of inner quadrant lesions and 20% of lesions in the outer quadrant have already spread to the anterior mediastinum when treatment is instituted. This finding suggests that the spread of the disease is primarily by direct lymphatic extension. Table XI shows the comparative five-year survivals. When the inner quadrant is involved the five-year survival is 27% as compared with 52% when the

Table XI
INFLUENCE OF SITE OF PRIMARY

CARCINOMA BREAST 1933-46 (PRE-OPERATIVE)		
	NO. CASES	% 5 YEAR SURVIVAL
All Cases	135	41.5%
Inner Hemisphere Involvement	58	27.6%

outer hemisphere is the site of the primary. To date, only one case of the pre-operative group with an inner hemisphere lesion in this series has survived ten years without recurrence.

That the incidence of early haematogenous metastases may be indirectly related clinically to possible abnormal hormone stimulation is further suggested by the comparative incidence of metastases during the first year after treatment in this series. The last table shows that the menopausal influence surpasses the other two influences by at least 20%. This percentage agrees with the percentage of early Stage I cases which develop unexpected metastases. Since approximately 30% of all carcinomas of the breast develop during the menopausal age, and without this group the five-year survival approaches 60% in the more advanced cases irradiated pre-operatively, any method of counteracting or correcting suspected hormonal stress prior to treatment would probably improve the overall five and ten-year survival rates to a greater extent than further advancements in the present surgical and radiotherapeutic control.

Table XII

A comparison of clinical factors influencing prognosis.

PRE-OPERATIVE RADIOTHERAPY		
CARCINOMA BREAST 1933 - 1947		
GROUP	NO. CASES	% RECURRENCES IN 1st YEAR
Inner Hemisphere (Primary)	58	45%
Rapidly Growing Tumour	70	50%
Menopause at Onset	39	70%
TOTAL	135	45%

Summary and Conclusions:

1. The treatment plan employed by the Department of Radiotherapy, Toronto General Hospital for all categories of carcinoma of the breast has been outlined.
2. The advantages of the five-stage classification for carcinoma of the breast for planning treatment have been discussed.

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3. The irradiation methods have been outlined for both pre- and post-operative X-ray treatment of carcinoma of the breast.
4. A statistical analysis has been presented which stresses the advantage of pre-operative radiotherapy in preference to post-operative irradiation.
5. The probabilities of control of carcinoma of the breast have been discussed.
6. With the exception of the stage of the disease, further statistical studies show that the coincidence of the onset of the disease with the menopause seems to be the most important clinical factor influencing the prognosis of carcinoma of the breast.

Acknowledgements:

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INTRAMURAL EXTRAMUCOSAL TUMOURS OF THE STOMACH*

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Intramural extramucosal neoplasms of the stomach wall can be conveniently discussed as a single group, from a clinical and radiological point of view. Their chief differences are histological.

They are said to be the commonest tumour of the stomach. In one report they were described as occurring in 23 cases in a series of 50 autopsies.¹ In surgical pathological series, they are found to be quite rare. This indicates that the vast majority remain small and asymptomatic.

Clinical Findings

There are no pathognomonic symptoms or signs. There is no difference in sex incidence. The average age incidence is about 55, but the range extends from the third to eighth decades. Two-thirds of the patients complain of various forms of gastric distress, such as gas and belching, vague indigestion, nausea and vomiting, or ulcer type of pain. Two-thirds show some evidence of bleeding. This may be insidious, resulting only in a secondary type of anemia, or it may manifest itself as melena, or hematemesis.² Occasionally the hemorrhage is severe and exsanguinating. Obstruction is less common and may be related to different postures if the tumour is pedunculated.³ In some a palpable mass is encountered.

Pathological Findings

This group of tumours is composed of leiomyomas, lipomas, fibromas and neurofibromas, and their malignant counterparts. The neurofibromas include such subgroups as neurilemmomas and schwannomas.

The lesions may grow from the wall outward into the peritoneal cavity and become huge. These cannot be distinguished by x-ray from lesions of the abdomen involving the stomach from without.⁴ Most of the tumours seem to project into the lumen, however.

The majority are benign throughout their course. Many others appear benign to gross

inspection, (and at radiological examination), but histologically show evidence of malignant transformation. Those which are malignant from the beginning probably cannot be distinguished radiologically from carcinoma.

The tumours are generally rounded and discrete, and may show slight lobulation. They may be very soft, rubbery, firm, or hard. Calcification in the mass is rare, but as in leiomyomas of the uterus, those of the stomach may occasionally show foci of calcification.

The gastric mucosa is draped smoothly over the tumour and the normal rugal folds are erased. The mucosa may be considerably thinned and atrophic.

Approximately half the malignant and one-third of the benign cases show a solitary ulcer, often situated on the dome of the mass, although it may be eccentrically located.⁷ The crater tends to be narrower and deeper than that of peptic ulcer. It is usually small in comparison with the total size of the tumour.

Radiological Findings

Radiologically, the lesions appear as sharply defined, smoothly rounded or slightly lobulated translucencies, projecting into the lumen of the stomach.

The tumours are sessile, but may be partially pedunculated. Usually being round, they project into the lumen a distance approximately equal to their extent along the wall. They are slightly commoner in the distal one-third of the stomach. Peristaltic activity shows little or no disturbance, unless the tumour is quite extensive.

An important finding is that of an abrupt angle formed by the normal stomach wall and the edge of the tumour, as it projects into the lumen. This angle is often quite acute. The mucosa over the tumour is smooth and regular with all rugal markings erased. The mucosa elsewhere in the stomach is normal in appearance and pattern. The markings cease abruptly without swelling or distortion, at the edge of the tumour. The folds adjacent to the tumour are soft and pliable, indicating a lack of infiltration, either inflammatory or neoplastic.

*Presented at the Annual Meeting of the Canadian Association of Radiologists, Toronto, Ont. January 28-30th., 1953.

Quite often the normal mucosal folds of the opposite wall show through the translucency of the tumour.

The presence of an ulcer helps establish the diagnosis. En face, it is round and may be central or excentric in location. In profile, the crater is at or near the summit of the mass. It is sharply defined, rather narrow and deep. There is no evidence of accompanying spasm or incisura of the gastric wall opposite the ulcer. The mass of the tumour may cause an inward drag on the stomach wall to give a pseudo-pedunculated appearance.

Not all of these features may be demonstrated in each case on routine films. Many additional features can be brought out by use of graded-compression spot-films, and exposures with the patient in various positions. Too much or too little barium may obscure the picture. Use of air-barium contrast often shows up finer details of the mass. Gianturco,⁵ describes a technique using barium and mineral oil as the contrasting media, which shows up lesions of this sort to very good advantage.

Differential Diagnosis

Recognizing the fact that roentgenologically some of these tumours may be grossly benign but histologically malignant, the radiologist should be able at least to separate these from carcinoma of the stomach. Unfortunately, this is not always the case. Lowman, Shapiro, and Kushlan⁶ described details of three cases of carcinoma which had

all the roentgen characteristics of benign extramucosal tumours. Most malignant tumours show more extensive ulceration and a more irregular surface. Infiltration extending beyond the tumour mass erases peristalsis, obliterates the sharp angle between the tumour and the adjacent stomach wall, and deforms the surrounding rugal pattern. Carcinoma tends to extend farther along the wall than it does into the lumen. The ulceration is relatively shallow and broader. (Figs. 1, 2 and 3.)



Fig. 2
Carcinoma of Stomach



Fig. 1
Carcinoma of Stomach



Fig. 3
Spot film of lesion shown in Fig. 2

Benign gastric polyps occasionally may be difficult to distinguish from intramural tumours. Polyps can produce a similar en face defect, but being intraluminal the characteristic profile defect is lacking. Demonstration of a long narrow stalk, or of multiple tumours, favors a diagnosis of polyp.

Deposits of aberrant or ectopic pancreatic tissue in the gastric wall can produce an identical roentgen picture to that of intramural extramucosal neoplasms. These are rarely over 3 cms. in diameter and usually have a small duct-orifice which may simulate the ulcer crater seen in the neoplastic tumours. Pancreatic rests usually are located in the greater curvature in the prepyloric region. Pancreatic rests do not bleed.²

Certain extrinsic masses may be closely applied to the stomach and produce defects much like those of intramural extramucosal tumours.⁷

Tumour masses in the left lobe of liver, ectopic spleen, and pancreatic cysts fall into this group. They may cause wiping out of rugal markings of the adjacent mucosa, and can produce a sharp angle at the edge of the deformity.

Palpation or change in position may allow displacement of the stomach from the adjacent mass, or at least may change the angle at the edge of the mass to a round curve. The demonstration of an ulcer related to the mass generally rules out an extrinsic lesion.

Case Reports

Case 1: H.R., female, age sixty-six, was admitted to hospital in coma. She had been apparently in good health until three days before admission when she passed a tarry stool. The following day there was a massive hematemesis. The evening before admission another hematemesis occurred and the patient gradually became comatose.

Physical examination was non-contributory. The hemoglobin was 26%.

Roentgen examination of the stomach showed a circular mass in the mid-body measuring 2-3 cms. in diameter in the centre of which was a small ulcer crater. The mass had a distinct outline and obliterated the gastric rugae. There was no evidence of infiltration around the tumour. Films making use of double-contrast confirmed the discrete nature of the tumour, and the sharp angulation between the tumour and the adjacent stomach wall. (Figs. 4 and 5.)

At operation, a freely movable tumour was felt deep in the stomach in its mid-portion. The tumour mass was excised along with a small rim of surrounding normal tissue. The tumour measured 4 x 4 x 3 cms. The mucosa over it was smooth and velvety but no ulcer was recognized. On the centre of the mass, there was a tiny white spot which was considered as the site of the ulcer demonstrated by x-rays which had been made three weeks earlier.



Fig. 4, Case I
Leiomyoma of Stomach

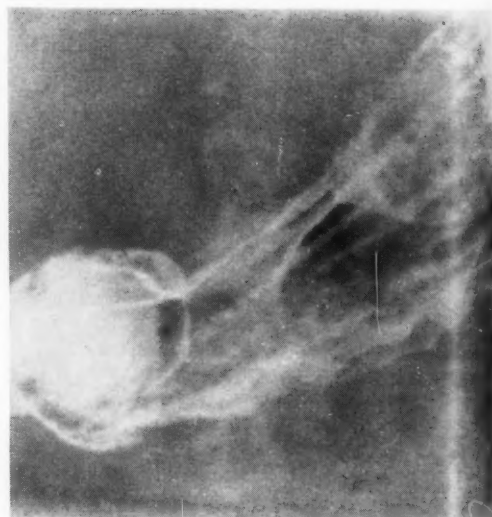


Fig. 5, Case I
Air-Contrast Study

Histologically the tumour was leiomyoma.

The post-operative course was uneventful, and on discharge the hemoglobin was 90%. One year later, the patient was well with no evidence of bleeding or anemia.

Case II: B.W., female, age forty-nine, experienced a bout of nausea. She consulted her physician the following day, and the examina-

tion was negative except for a hemoglobin of 40% and a history of occult blood in the stool.

Roentgen examination showed a large smooth filling defect in the upper portion of the body of the stomach. It appeared to move somewhat within the stomach under the palpating hand, although a definite mass could not be felt. An ulcer was present on the summit of the mass. The surrounding rugae did not show any evidence of deformity, and they ceased abruptly at the edge of the mass. A sharp angle was present at the junction of the tumour and the adjacent stomach wall. (Figs. 6 and 7.)

At operation a soft mass was felt in the upper portion of the stomach. It was excised along with a small rim of normal stomach around the base of the tumour. The mass was ovoid, discrete, and measured 7 x 5 x 4 cms. It was covered by smooth mucosa. There was an ulcerated area measuring 2 cms. in greatest diameter. The ulcer had a punched-out appearance and extended for a depth of 1.7 cms., and contained blood clot. (Fig. 8.)



Fig. 6, Case II
Neurilemmoma of Stomach
Profile view



Fig. 7, Case II
Neurilemmoma of Stomach
En face view

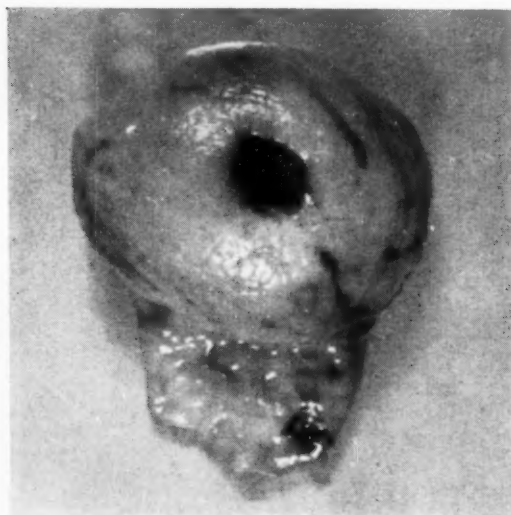


Fig. 8, Case II
Neurilemmoma of Stomach
Gross pathological specimen

A histological diagnosis of neurilemmoma was made.

Case III: N.P., female, age twenty-five, was admitted to hospital on November 18th, 1952. In February, 1952, she appeared at clinic, four and one-half months pregnant. The hemoglobin was 64% and the patient was placed on iron treatment. In succeeding months, the hemoglobin gradually fell till

June when it was 34%. In July, the patient was delivered. At that admission, considerable amounts of blood were administered. In September, she appeared at Surgical Clinic complaining of nausea and epigastric pain. A hemoglobin of 72% was recorded. In October, the hemoglobin had fallen to 67% even though the patient was continuing her iron medication. In November, it was 50%. Some examiners could feel a very mobile mass in the epigastrium, but at other times the mass could not be palpated. The patient was referred for x-ray investigation of the mass.

Roentgen examination showed a sharply defined, hemispherical filling defect in the prepyloric region of the stomach with its base on the greater curvature. This defect corresponded to the palpable mass. At its apex was a large ulcer crater extending deeply into the tumour mass. The surrounding gastric mucosa was not disturbed. Peristaltic waves passed down the stomach to within an inch of the tumor, at which time the whole antrum emptied simultaneously. There was no obstruction to passage of barium from the stomach. (Fig. 9.)



Fig. 9, Case III
Leiomyosarcoma of Stomach
Profile view

A partial gastrectomy was performed. Pathologically, the distal end of the stomach showed a mass in the wall extending into the greater omentum. It was 5.5 cms. in diameter and 4 cms. thick. (Fig. 10.) The serosal surface showed some nodular involvement. There was a deep ulcerated defect in the mucosa measuring 1.5 x 1 cm. in diameter extending to a depth of 2 cms.

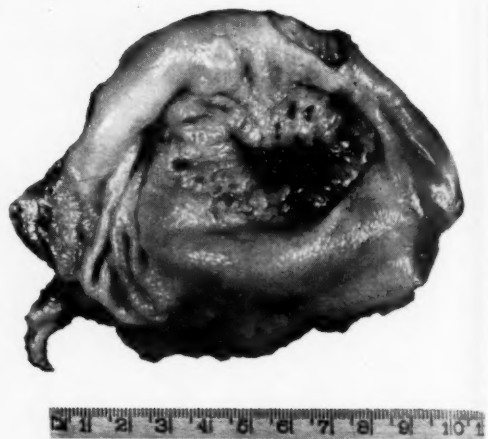


Fig. 10, Case III
Leiomyosarcoma of Stomach
Gross pathological specimen

Histologically, the tumour was a leiomyosarcoma with diffuse involvement of a wide area of stomach beyond the actual tumor mass.

Summary

Intramural extramucosal tumours of the stomach are not commonly encountered in clinical practice. They cause mild gastric symptoms and often ulcerate and bleed.

Many produce a fairly characteristic x-ray appearance, which when recognized should lead to the diagnosis.

The chief difficulty is, that once recognized, the radiologist cannot distinguish between those which are benign and those which may turn out to be histologically malignant.

The treatment, therefore, is surgical removal.

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CHRONIC CHOLECYSTITIS AND ROKYTANSKI-ASCHOFF SINUSES

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The visualisation of Rokytanski-Aschoff sinuses during cholecystography is quite a rare occurrence, though they are usually seen by the pathologists in the wall of chronically inflamed gall-bladders.

They have been known to exist for a long time. In fact, these formations were described first by Von Rokytanski in 1842 and studied again by Aschoff in 1909.

They consist of hernia-like protrusions of the gall-bladder mucosa through its muscular layer and constitute what Akerlund and Rudhe³ call "intramural diverticula".

According to Robertson & Ferguson of the Mayo clinic who have studied 495 gall-bladders, diverticula exist in 93% of the chronically inflamed gall-bladders and are quite exceptional in gall-bladders before the age of 30.

Unfortunately, the Rokytanski-Aschoff sinuses do not often show in cholecystograms.

The first case was published by March in 1948, and was soon followed by a second case published by Ackermann during the same year.²

In 1950, a third case was published by Akerlund & Rudhe.³

During the same year Bean & Culver showed the fourth case.⁴

In 1951 a fifth case was found by L. Glücker in Haïpha.⁵

In 1952 a sixth case appeared in the literature, published by Zinober of Johannesburg.⁶

We believe that our case is the one which shows the Rokytanski-Aschoff sinuses most clearly and with calculi in the lumen of the gall-bladder at the same time. (Figure 1.)

Case Report: —

A male, age 40, complained of vague digestive distress of two years' duration, with loss of weight, asthenia, fatigue and epigastric pains radiating to his back or in girdle fashion.

Physical examination was negative.

Various laboratory tests were negative, except for an increase in blood cholesterol level (4.49 grm%).

Radiological investigations of the lungs, kidneys and gastro-intestinal tract were also negative.

A cholecystogram shows two calculi in a well visualised gall-bladder, and, after a fat meal, Rokytanski-Aschoff sinuses start to appear on the one-hour film but become much more visible on the five-hour film. They appear as a chain of pearl-like shadows around the contour of the gall-bladder lumen.



Fig. 1

Relief reproduction of original film showing Rokytanski-Aschoff sinuses associated with cholelithiasis.

A diagnosis of cholecystitis with lithiasis was made and the patient was operated upon. The diagnosis was confirmed and the pathologist reported the presence of multiple Rokytanski-Aschoff sinuses, some of them being 4 mm. in diameter.

Discussion: —

We must ask ourselves why these intramural diverticula are not more frequently visualised, inasmuch as they exist almost constantly in chronic cholecystitis, and their visualisation would be helpful in diagnosing this condition when no calculi are visible.

It is probable that the lack of due concentration in the diseased gall-bladder is one of the causes. Smallness of the sinus orifices

and thickness of bile might also prevent their filling. Alternatively, previous filling of the sinuses with thick non-opaque bile, cholesterol deposits or cellular detritus might keep out the contrast medium.

It seems that the effect of the fat meal absorbed after the first films, causing some muscular contractions of the gall-bladder, helps the filling of the sinuses. Every observer who has reported cases, has stated that the sinuses have appeared only after the fat meal.

Slow emptying of the gall-bladder on account of stricture, as in March's case, would permit visualisation of the intramural diverticula, particularly five hours after the fat meal.

Frequent distention of the gall-bladder in the course of the disease is said by some to have dissociated the muscular layer, causing a "looser" distribution of it, and this would favour the formation of diverticula. Better contrast media could also be a factor. In our case, "telepaque" was used.

Positioning seems important, and in our case, the sinuses showed better in an oblique position that outlined the anterior and posterior gall-bladder wall.

We believe with Akerlund and Rudhe that in pneumo-cholecystitis, 14 cases of which have been published, the visualisation of a surrounding gas layer was due to filling of intramural diverticula, and that this filling, interpreted by the authors as emphysema of the gall-bladder wall, has not been recognized as Rokytanski-Aschoff sinuses.

Possibly, many of us have overlooked these formations at one time or another and we believe that in many cases where the gall-bladder shadow is not sharply defined or shows some saw-tooth like contours, it is due to Rokytanski-Aschoff sinuses not fully developed and incompletely protruded through the muscular layer.

Conclusions: —

We have presented one case of visualisation of Rokytanski-Aschoff sinuses which appears to be the seventh case in the literature, and the only one associated with lithiasis.

The histo-pathology of that condition has been discussed and the radiological signs described.

Semi-lateral positioning and the five-hour post fat meal film are advisable to assist in demonstration of these sinuses.

We have mentioned the authors who have presented the previous cases and also a more complete bibliography, compiled by Akerlund and Rudhe in 1950, including all the publications of histo-pathological character on the subject and also the publication of 14 cases of pneumocholecystitis by various authors.

Acknowledgement is expressed to Dr. P. E. Côté and Dr. Guy Jacques, co-workers in our department, for their collaboration, and to Dr. Carlton Auger, pathologist, and Drs. Hector Beaudet and J.P. Drouin who have advised us in their respective domains.

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MEETINGS

The Canadian Association of Radiologists

1954 — Annual Meeting

The Annual Meeting of the Canadian Association of Radiologists will be held in Quebec City at the Château Frontenac, as follows:

Executive Meeting	A.M.	Wednesday, January 13th
Council Meeting	P.M.	Wednesday, January 13th
Annual Dinner and		
Annual Meeting	P.M.	Thursday, January 14th

Dinner and Meeting to be held in Ballroom

Commercial Booths January 13th, 14th and 15th.

Displayed in Ballroom

Scientific Sessions All Day January 14th and 15th

Held in Ballroom

Registration A.M. January 13th

Ballroom Foyer

Final details of the program will be sent to you as they become available.

IV Jornada Brasileira de Radiologia

The Radiology Department of The Parana State Medical Association and The Brazilian College of Radiologists will jointly sponsor the IV Jornada Brasileira de Radiologia, which will be held in Curitiba, Parana, Brazil, September 27th to October 3rd, 1953.

Moving Field Therapy

A Post-Graduate Course on Moving Field Therapy will be held by the Medical Clinic of the University of Erlangen following the 7th International Congress of Radiology in Copenhagen from 3rd to 7th August 1953. Noted specialists will lecture on the entire field of Moving Field Therapy, i. e. its physical principles, the technic of the apparatus involved, distribution and evaluation of doses, the medical principles, execution of treatments, indications, and results. By detailed demonstrations and exercises in small groups participants will be made familiar with the practice of Moving Field Therapy. Besides, provisions are made for a social program.

EDITORIAL

SEVENTH INTERNATIONAL CONGRESS OF RADIOLOGY

The Seventh International Congress of Radiology now belongs to the past. It was held in Copenhagen, Denmark, from the 19th to the 24th of July 1953, and was, unquestionably, a tremendous success in every respect.

The opening ceremony was honoured by the presence of His Majesty King Frederik IX and was most impressive. The President-elect, Professor Flemming Møller, delivered the welcoming address immediately before his investiture as the new President. Later, in the evening, all the congressionalists enjoyed an unforgettable reception at the Town Hall of Copenhagen.

During the week, several social activities contributed to the enjoyment and delight of those attending the Congress. There was a lovely excursion along the Danish Riviera with dinner at one of the finest summer resort hotels on the shores of the Baltic Sea. The banquet for the officers and official delegates at the Wivex Restaurant, next to the world-famous Tivoli Gardens, was an event long to be remembered. A whole day's excursion to North Seeland, including visits to the Danish Kings' Castle in Fredieriksberg and the Castle of Rosenborg, known as Hamlet's Castle, proved to be extremely popular with a crowd of some 2800 participating. City and museum tours as well as mannequin parades were organized for the ladies.

Scientific sessions were well attended. Some 500 papers were presented in four days. During certain periods of the day, papers were being presented simultaneously in as many as ten different halls. Papers by Dr. Jean Bouchard and also by Dr. Harold E. Johns represented Canada's contribution to the scientific programme.

Scientific exhibits were few and of moderate interest, except for a few which were outstanding. On the other hand, commercial exhibits were numerous and very spacious, and the display of radiological equipment was most attractive. The disposition and decoration of the commercial booths was artistically done. Flowers, plants of all types, statues, seating space and restaurant facilities all added greatly to make the exhibit hall more attractive than usual.

Nearly thirty Canadian radiologists attended the Congress. The Official Delegation from Canada was headed by a former president of the Canadian Association of Radiologists, Dr. Digby Wheeler of Winnipeg. The president of our Delegation also represented our country on the International Executive Committee—Canada being one of the seven countries to be nominated to that Committee as the result of a postal ballot.

Reports were presented by the heads of the various committees and will be published in full. An International Society of Radiology has been established instead of the proposed Federation of Radiological Societies. National radiological societies are invited to become affiliated and are requested to supply a complete membership list. The constitution of this new International Society remains to be elaborated.

The International Commission on Radiological Units reported no change in the definition and measurement of the "Roentgen" (r) up to 3 MeV. But an additional Unit has been adopted for radiation of higher energy than 3 MeV and it is called the RAD, which will be equivalent to 100 ergs per gram. The International Commission of Radiological Protection also presented a report in which perhaps the main item is the reduction of the permissible level of radio-isotope by a factor of 10.

The first report of the International Commission on Stage-Grouping in Cancer and the Presentation of the Results of Treatment of Cancer indicated that an agreement has been reached on the guiding principal in staging carcinoma of the breast and carcinoma of the larynx. Progress is also reported in the problem of cancer statistics.

It has been decided to continue to hold the International Congress of Radiology every three years. The next meeting will take place in 1956 in Mexico City. Professor Manuel Madrazo is the President-elect of the future Eighth International Congress of Radiology and he has extended a cordial invitation to all radiologists to attend the Congress in Mexico City in 1956.

The over-all registration at the Congress was 3500. The Danish Board of Management of the Seventh International Congress deserves congratulations for the very efficient and extremely pleasant way in which they organized the Copenhagen Congress.

JEAN BOUCHARD, M.D.

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